



(12) **United States Patent**
Suzuki

(10) **Patent No.:** **US 9,410,221 B2**
(45) **Date of Patent:** **Aug. 9, 2016**

(54) **AUTOMOBILE PART, MANUFACTURING METHOD FOR SAME AND MANUFACTURING DEVICE OF SAME**

(2013.01); **C21D 1/70** (2013.01); **C21D 9/28** (2013.01); **C21D 9/40** (2013.01); **F16C 3/02** (2013.01); **F16D 3/20** (2013.01); **F16D 2250/0053** (2013.01); **Y02P 10/253** (2015.11)

(75) Inventor: **Shintaro Suzuki**, Iwata (JP)

(58) **Field of Classification Search**
CPC **C21D 9/0068**; **C21D 9/28**; **C21D 1/42**
See application file for complete search history.

(73) Assignee: **NTN CORPORATION**, Osaka (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 656 days.

(56) **References Cited**

U.S. PATENT DOCUMENTS

(21) Appl. No.: **13/819,014**

6,509,099 B1 * 1/2003 Urata et al. 428/423.1
2005/0230380 A1 10/2005 Yoshino et al.
2011/0136580 A1 6/2011 Ooba et al.

(22) PCT Filed: **Sep. 1, 2011**

(86) PCT No.: **PCT/JP2011/069888**

FOREIGN PATENT DOCUMENTS

§ 371 (c)(1),

(2), (4) Date: **Feb. 26, 2013**

CN 1936032 3/2007
EP 1 270 089 1/2003
JP 04-246121 9/1992

(87) PCT Pub. No.: **WO2012/039255**

PCT Pub. Date: **Mar. 29, 2012**

(Continued)

OTHER PUBLICATIONS

(65) **Prior Publication Data**

US 2013/0180629 A1 Jul. 18, 2013

English Translation of Kanetake (JP54-123511) (Sep. 25, 1979).*

(Continued)

(30) **Foreign Application Priority Data**

Sep. 22, 2010 (JP) 2010-212299

Primary Examiner — Jesse Roe

(74) *Attorney, Agent, or Firm* — Wenderoth, Lind & Ponack, L.L.P.

(51) **Int. Cl.**

C21D 1/10 (2006.01)

C22C 28/00 (2006.01)

C21D 9/00 (2006.01)

C21D 1/42 (2006.01)

C21D 9/28 (2006.01)

C21D 9/40 (2006.01)

F16C 3/02 (2006.01)

F16D 3/20 (2006.01)

C21D 1/70 (2006.01)

(57) **ABSTRACT**

Provided is a manufacturing apparatus for an automobile part, comprising: a conveying path (20) for transferring an outer joint member (10) which is made of a metal and has an outer surface coated with a coating agent after induction quenching; and high-frequency induction coils (21, 22) arranged along an automobile part transferring direction of the conveying path (20), for simultaneously performing tempering of the outer joint member (10) and baking of the coating agent.

(52) **U.S. Cl.**

CPC **C21D 9/0068** (2013.01); **C21D 1/42**

6 Claims, 8 Drawing Sheets

